USGS

WATER RESOURCES RESEARCH GRANT PROPOSAL

Title: Economic and Hydrologic Analysis of Integrated Wetland Reservoir and Subirrigated Agricultural Production Systems

Duration: Two Years, September 1/1997 to August 31/1999

Federal Funds Requested: $40,880

Non-Federal (Matching) Funds Pledged: $81,760

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Congressional District: 15th Ohio

Statement of Critical Regional and State Water Problems:

The United States' Midwest is the most productive agricultural region of the world and this productivity relies heavily upon the practice of drainage. Agricultural drainage is the removal of excess water from the soil surface and/or soil profile of cro pland, by either gravity or artificial means. Historically, the main reason for drainage on agricultural land has been to enhance crop production. Northwest Ohio was once known as the "Great Black Swamp." In the 1850's, Ohio drainage laws were passed, and what followed was a series of extensive, man-made drainage outlets, which permitted the area to be drained, cleared, and farmed. Water management practices in northwest Ohio are now more important than ever, especially for: 1) continued prosperous agricu lture; 2) the quality of Lake Erie water; 3) the local economy; and 4) restoration and preservation of wildlife habitat areas. Landowners are encouraged to install practices of surface drainage, subsurface drainage, and best management practices necessary for sustained agricultural performance and improvement of water quality. The quality of water being supplied to Lake Erie is affected by nonpoint source agricultural runoff. The impairment of Lake Erie water quality is a direct result of poor cropping-ma nagement practices incorporated with outdated surface and subsurface water management techniques. Sediment, phosphorus, and agricultural chemical runoff is the most prevalent concern of the International Joint Commission. It was once estimated that the Ma umee River Watershed contributed approximately 1.2 million metric tons of sediment to Lake Erie annually. The nonpoint source phosphorus reduction goal for this area was established by the International Joint Commission Water Quality Agreement at 900 metr ic tons per year. A related issue is the impact of "Best Management Practices (BMP), which are identified as the most cost effective option to addressing nonpoint source pollution. However, in a typical scenario of an 80-acre northwest Ohio farm, the adop tion of all appropriate BMP's will reduce sediment detachment and movement by 80 tons' or 66%. This level may be acceptable

under today's standards, but we believe strongly in the need to go beyond this level of protection, focusing on long term cost effe ctiveness, and effective implementation of workable alternative strategies.

Agricultural drainage is necessary for economical and efficient crop production in the Midwest, but there is an environmental cost. Inventory data indicate that 22 states have lost 50% or more of their original wetland areas. In the Great Lakes states of Ohio, Iowa, Indiana, and Illinois, 85% or more of the original wetland acreage has been lost. In Ohio alone, as in other great lakes drainage areas, much of what remains is part of either the coastal wetland areas or woodlands. Most of the decline occu rred within the past 50-year period, with some sources citing 87% of wetland losses occurred from the mid

1950's to mid 1970's. Within the eight-county Maumee Valley Resource Conservation and Development Area (RC&D), total loss is estimated at 122,555 acres. Loss of wetlands as associated with declines in wildlife habitat, adverse effects on water qual ity, and other impairment of healthy ecosystem function has become an important environmental issue. In typical farming communities of northwest Ohio, 80 to 90% of all land use is cropland. To say that the development of wetlands by individual farmers has been overwhelmingly ill-received is an understatement. Farmers continually find themselves in an economic squeeze of higher costs and lower net returns, and as a result, the potential to develop wetlands is far removed. To be successfully adopted by indi vidual land owners, any practice of wetland development must be cost effective, and must stand alone without government aid. Progressive farmers and their organizations, natural resources conservation agencies, environmental agencies and organizations, an d others seek guidance to help society and agriculture better understand how to conserve existing beneficial wetlands and recreate valuable wetlands, and are asking how to accomplish these goals by demonstrating how farmers may use technology and economic incentives for sustaining agricultural productivity and profitability while addressing environmental problems. As the society considers the loss of environmental quality associated with drainage, the continuing need for economical food production must al so be considered. Little or no research has been conducted on the hydrologic interactions and the economics within the direct linkage of an agricultural production system and a wetland/reservoir ecological system within the US.

Statement of Results and Benefits:

An existing and funded demonstration project demonstrates construction and management of permanent wetland/reservoirs linked directly to subirrigated corn and soybean production systems on field-sized areas. Runoff and drainage from these prior convert ed cropland areas seasonally feed wetland/reservoirs, which provide water quality and wildlife habitat functions. An equally important function is supplemental water supply to sustain high levels of corn and soybean yields through a state-of-the-art subir rigation crop production system. This innovative, ecologically sound crop production system will recycle runoff and drainage waters, and thus reduce runoff, subsurface drainage, sediment, and agricultural chemical discharges to streams, improve water qual ity, increase wildlife habitat, increase wetland acres, and enhance farm

profitability. Our proposed research and the demonstration project results will provide the basis for the technical and management guide to be developed with focus on environmental a nd economic benefits, site identification, water supply, engineering design, construction, and system operation and management. We expect that results from this project will lay the foundation for GIS/Remote Sensing and watershed modeling research that ev aluates various application scenarios and predicts the influence of this integrated system on a watershed scale. All aspects of the proposed project will feed into state and regional educational activities conducted cooperatively by Ohio State University Extension, the demonstration project team, and the Overholt Drainage Education and Research Program at The Ohio State University. The results from this project should have implementation implications for the entire Midwest region of the US.